

Claims

1. A process of generating transgenic plants or plant cells transformed on their plastome, comprising
 - (a) introducing into plant plastids a first DNA molecule and a second DNA molecule, wherein
said first DNA molecule contains a first region homologous to a region of the plastome for directing plastome integration and a first sequence of interest, and said second DNA molecule contains a second region homologous to a region of the plastome for directing plastome integration and a second sequence of interest, whereby a sequence segment of said first sequence of interest is homologous to a sequence segment of said second sequence of interest, and
 - (b) selecting transformants having an integration sequence stably integrated in the plastome, whereby said integration sequence contains at least a portion of said first and at least a portion of said second sequence of interest as a continuous sequence.
2. The process according to claim 1, wherein said first and said second DNA molecule are introduced into said plant plastids by co-transformation.
3. The process according to claim 1 or 2, wherein said first and said second sequence of interest are different.
4. The process according to any one of claims 1 to 3, wherein said first and said second sequence of interest each contains a further sequence in additions to said sequence segment.
5. The process according to any one of claims 1 to 4, wherein one or more additional DNA molecules are introduced into said plant plastids in addition to said first and said second DNA molecule, whereby said additional DNA molecule(s) comprise(s) additional sequence(s) of interest.
6. The process according to claim 5, wherein said one additional DNA molecule contains a sequence segment homologous to a sequence segment of said first sequence of interest and a sequence segment homologous to said second sequence of interest.

7. The process according to any one of claims 1 to 6, wherein said first and/or said second and/or an additional sequence of interest contains one or more genes of interest or fragments of a gene of interest.
8. The process according to any one of claims 1 to 7, wherein a gene of interest is split into two or more fragments and wherein said first and/or said second and/or an additional sequence of interest contains a fragment of said gene of interest, whereby said gene of interest is assembled from said two or more fragments upon formation of said integration sequence.
9. The process according to any one of claims 1 to 7, wherein said first sequence of interest contains a 5' part of a gene of interest and said second sequence of interest contains a 3' part of said gene of interest and said integration sequence contains said gene of interest such that it can be expressed.
10. The process according to claim 9, wherein expression of said gene of interest includes RNA trans-splicing.
11. The process according to claim 9, wherein said first sequence of interest contains upstream of said 5' part of said gene of interest a sequence element homologous to a sequence element located downstream of said 3' part of said gene of interest of the second sequence of interest, whereby said sequence elements enable excision by homologous recombination of a part of said integration sequence that comprises said 5' and/or said 3' part of said gene of interest.
12. The process according to any one of claims 7 to 11, wherein said gene of interest is a selectable marker gene.
13. The process according to any one of claims 1 to 12, wherein said first or said second DNA molecule contains a selectable marker gene outside of a sequence unit consisting of the region homologous to a region of the plastome and the sequence of interest, for allowing loss of said marker gene.
14. The process according to any one of claims 1 to 12, wherein a selectable marker gene is split into a first and a second fragment, whereby

said first fragment is incorporated in said first DNA molecule outside of a first sequence unit and

said second fragment is incorporated in said second DNA molecule outside of a second sequence unit,

whereby said first sequence unit consists of said first homologous region and said first sequence of interest and said second sequence unit consists of said second homologous region and said second sequence of interest.

15. The process according to any one of claims 12 to 14, wherein said selectable marker gene is aphA-6.
16. The process according to any one of claims 1 to 15, wherein said first DNA molecule contains only one region homologous to a region of the plastome for directing plastome integration.
17. The process according to any one of claim 1 to 15, wherein said first and said second DNA molecule each contains only one region homologous to a region of the plastome for directing plastome integration.
18. The process according to any one of claims 1 to 17, wherein said first and said second homologous region together correspond to a continuous sequence of the plastome to be transformed.
19. The process according to any one of claims 1 to 18, wherein homoplastomic transgenic plants are regenerated from said transformants.
20. Kit-of-parts comprising a first and a second DNA molecule as defined in any one of claims 1 to 19.
21. DNA molecule for plastid transformation containing one region homologous to a region of a plastome for directing plastome integration and a sequence of interest.
22. Library of DNA molecules according to claim 21, whereby each of said DNA molecules contains a different sequence of interest.

23. Plant or plant cells transformed with said DNA molecules of said kit-of-parts according to claim 20 or with said DNA molecule according to claim 21.
24. Plant, plant cell or seeds obtained according to the process of one of claims 1 to 19.